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Water Resources Conference: Watershed Planning in Maine

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by Nick Houtman

Watershed planning in Maine suffers from several problems that were identified during a water resources conference held at the University of Maine in late April. Among these problems are:

- Data are often lacking to describe watershed scale processes adequately for planners.
- Important water management interests may have been ignored in the past or, conversely, were not willing to participate in planning processes. At the same time, for large watersheds, hearing from all of the parties interested in the planning effort may make decision-making processes slow and unwieldy.
- Inflexible regulatory policies, such as project-by-project hydroelectricity relicensing, may prevent significant watershed factors from being used in planning decisions.

These and other problems were considered at the one-day conference, which was sponsored by the Water Resources Program at DM and which was attended by representatives of utilities, state and federal agencies, soil conservation districts, consulting firms, and colleges. Conference participants noted that, among other things, watershed planning has been used to re-open shellfisheries (Waldoboro), to manage water quality in rivers (Kennebec, St. Croix, Penobscot, Presumpscot), lakes (Sebago, Moosehead) and marine waters (Damariscotta Estuary, Casco Bay and Gulf of Maine), and to optimize hydropower production. Further, watershed boundaries were recommended as the fundamental planning context for water quality assessments by the state Water Resources Management Board in 1991. It was also noted that watershed planning is a data intensive, collaborative process that makes sense under most, but not all, circumstances. Moreover, Maine's capacity for watershed planning resides within the private sector as well as state and local governments. It is unlikely that a new state office will be created to investigate and to help resolve conflicts over water supply. Finally, all plan participants should be involved early in the process. Interests not included may be forced to take an adversarial position and thus delay agreements.

Planning challenges

A watershed is the land over which water flows to reach a lake, a stream, groundwater or the ocean. It includes the interconnected network of flowing waters. For rainfall runoff or snowmelt, the amount of flow and its quality depend on natural factors such as bedrock geology, soils and vegetative cover as well as land use. These factors define the nature of the watershed and affect its ability to sustain fisheries, produce electricity, support rafting businesses, assimilate wastewater and provide drinking water.

Since biological, chemical and physical attributes are controlled by watershed scale processes, planning for water management should be at that level. However, as previously noted, watershed planning in Maine faces several challenges:

- Addressing the lack of data. Although the flows of large main stem rivers are generally well characterized, most sub-basins are not monitored. Groundwater storage is a critical, but difficult to measure, component of the hydrologic cycle.
- Making the planning process more inclusive and simultaneously trying to keep the process from becoming too lengthy and too costly.
- Developing more flexible regulatory policies that ultimately will assist the planning process.

As conference speakers noted, data have been collected in Maine during the last decade on factors such as point and non-point source pollution, acid deposition, coastal water quality and water use. This information forms part of the context in which watershed planning occurs. Some of this information was summarized by speakers at the conference.

Water quality conditions

Dave Courtemanche of the Maine Department of Environmental Protection (DEP) described the Maine Water Quality Assessment Report, which is a biennial report on statewide water quality compiled by DEP. The 1994 report indicates that of Maine's estimated 31,230 stream miles, 211 miles fail to support full use because of fish advisories for dioxin on the Kennebec, Penobscot and Androscoggin Rivers. Another 231 miles do not support uses because of toxic contamination, low dissolved oxygen levels or bacteria. Thus, just under two percent of all river and stream miles fail to completely attain Clean Water Act standards. Most of these miles are on large river stems. The report also notes that because the State has addressed point source discharges for many years, non-point source problems now account for the majority of water quality problems. Fish kills have declined dramatically since the 1950s and 1960s when the state experienced five to six massive die-offs a year.

In the 1994 report, the state assessed 2,314 lakes (out of an estimated 5,800 statewide) and found that 76 percent fully support uses while another 14 percent are "threatened" and the remainder partially support their uses. Low dissolved oxygen and algal blooms are the two major causes of partial support. The most significant contaminant sources are agriculture, shore development and harvested woodlands. Bacterial contamination of estuarine waters is the largest cause of non-attainment along the coast. The extensive closures of shellfisheries reflects wastewater discharges from communities, single homes and boats. Groundwater contamination data demonstrate the presence of pesticides, radon, arsenic, nitrate, microorganisms and road salt in some wells. On a statewide basis, the three later constituents affect few wells and do not appear to be a significant health threat. While radon is common in Maine's groundwater, the extent of pesticide and arsenic contamination is less well known. Arsenic comes from both natural and human sources. Sources of groundwater problems include landfills, fertilizer application, septic systems, and underground petroleum storage tanks. The incidence of contamination by petroleum products continues to increase, and the state has about 38,000 registered underground tanks. It is assumed that the increase reflects residuals from old tanks which have been replaced.

Acidic deposition

Precipitation in Maine is acidic and ranges on the pH scale from the high 3's to the low 5's with a mean in the mid 4's, according to Steve Kahl of the University of Maine's Sawyer Research Center. Studies of precipitation chemistry suggest that rainfall in the Northeast tended to be around 5.0 historically. Acid deposition is thought to affect fewer than 100 Maine lakes, many of which appear to have been acidic before the industrial age. Data collected over the past twelve years indicate that Maine lakes in general have become slightly less acidic, Kahl reported. As a group, 75 percent of Maine lakes have a pH level between 6.5 and 8.5. Lakes that tend to have a lower pH, i.e., be more acidic than the average, include high elevation lakes, those associated with wetlands and those which receive their input largely from the atmosphere. These lakes appear to be more sensitive to acidic inputs than lakes in general.

Accurate pH data have been collected only since the early 1980s, and they do not indicate long-term trends. However, work on sediment cores has led to the conclusion that some lakes have been acidified by atmospheric deposition since the mid-19th century. Evidence indicates that most lakes, however, show no change in acidity status over the long term. With the recent decline in sulfur dioxide emissions, nitrogen compounds are becoming a more significant component of atmospheric deposition. One possibility is that nitrogen inputs are beginning to exceed the ability of forested ecosystems to absorb them. Impacts to Maine's forests are unknown, but potential changes in nutrient cycling are both an environmental and an economic concern.

Allocations for water use

Water resources management requires knowledge of water inputs and outputs distributed over time, said Marc Loiselle of the Maine Geological Survey and Marilee Horn of the U.S. Geological Survey. In addition to providing surface flows for a variety of purposes, watersheds store water for future use. Primary inputs are precipitation and stream flows, and outputs include evapotranspiration, river discharge to the ocean and consumption for domestic and economic purposes. Groundwater inputs and outputs are assumed to be negligible at the large watershed scale.

A compilation of statewide water use in 1990 indicated that about 532 million gallons of fresh water are withdrawn per day in Maine for a variety of purposes. About 48 percent is withdrawn for industrial purposes, the highest portion in New England and possibly the country. Another 15 percent is withdrawn for once-through cooling in power plants, and 17 percent is split between rural homes, agriculture, sand and gravel operations and commercial businesses, including snowmaking and fish hatcheries. Public supplies withdrawn by municipal systems account for another 20 percent, about 106 million gallons per day. Since public wastewater discharges account for about 129 million gallons per day, the reasons for the discrepancy have been studied. Possibilities include supplies discharged into the sewers but not accounted in water use figures, groundwater infiltrating sewer pipes and inaccuracies in data collection.

Efforts are underway by the U.S.G.S, the Maine Geological Survey and the Maine Department of Human Services to improve the state and regional water use database. Data are currently collected by regulated entities such as water suppliers, wastewater dischargers and electric

utilities. Each entity uses different units and different methods. Uncertainties arise as a result of this fragmented data collection and reporting process.

Coastal water quality

Coastal water quality data have been collected over the past several years, according to Bill Ferdinand of the Maine State Planning Office. Data categories include toxic chemicals, microorganisms, nutrients and sediment. Toxics include heavy metals, pesticides and organics (dioxins, PCBs, etc.).

Ecological and human health impacts are not well known, and research is needed in this area. Ongoing efforts include the Maine Mussel Watch, the National Oceanic and Atmospheric Administration's Status and Trends project and university and private research projects. The Mussel Watch shows high elevations of metals at some locations, such as lead and cadmium at Boothbay Harbor and Sears Island and chromium in the Kennebec and Saco rivers. Mercury levels appear elevated in Cobscook Bay, Penobscot Bay and the Presumpscot estuary. For many metals, elevated levels have been found in unexpected places, but sources have not been traced. Possibilities include point source discharges, urban runoff and historical land uses. The possibility exists that errors could have been done in data collection and analysis.

Microorganisms include viruses, bacteria and parasites. Affordable testing methods are not available for all microorganisms, and agencies depend on a few indicator organisms to signal the likely presence of pathogens. Fecal coliform are used as an indicator of potential shellfish contamination while enterococci are used in salt water swimming areas. Shellfish closures may occur because of a lack of monitoring, the presence of a point source discharge or the documented presence of pathogen indicators.

Future management of coastal water quality will require continued monitoring as well as research on impacts and contaminant transport within watersheds. Without this fundamental information, efforts to control pollution sources may be difficult to justify, said Ferdinand.

The conference also featured three concurrent sessions that focused on needs related to hydropower relicensing, water withdrawals and nonpoint pollution. A more detailed summary of the conference is available from the Water Resources Program, 5715 Coburn Hall, University of Maine, Orono, Maine 04469.